

# Low Phase Noise Universal Microwave Oscillator for Analog and Digital Devices, Phase I

Completed Technology Project (2009 - 2009)



## Project Introduction

An inherently rugged Universal Oscillator (UO) is needed to enable a superior class of configurable communications for NASA applications. The requirements are a low phase noise RF output concurrently with a rugged, reliable, small, power efficient, and frequency tuning ability. VIDA Products has developed technology that will ultimately enable an integrated circuit YIG oscillator with high Q resonators and low power consumption that fills these requirements. The high Q YIG resonators are made possible by quantum electron spin precession and are essentially lossless. In general, a resonator is realized by a YIG sphere RF magnetic fields coupling to the oscillator circuit structure. A bias magnetic field on the spheres at a right angle to the coupling field vector sets the frequency of operation. It is a linear function of exactly 2.8 MHz per Gauss. Its equivalent electrical circuit is composed of circuit elements unrealizable by finite components that vary over frequency so the filter bandwidth does not change with tuned frequency. Thus the Q increases with frequency since a definition of Q is the tuned frequency divided by the bandwidth. For oscillators using these resonators the phase noise is excellent and continues to perform as the oscillation frequency increases. The Resonant Ring Oscillator topology is easily realizable using MMIC technology to reduce a YIG based oscillator to a single IC with the ability to produce external fields of the correct vectors and path losses. To make use of this phenomenon, a proprietary circuit utilizing leakage shielding and frequency locking will control the magnetic bias field and be integrated in the UO IC. The result will be a Universal Oscillator that can be produced to operate at any frequency between 3 and 30 GHz at cost equivalent to current VCO technology but with 30 to 40 dBc improvement in phase noise performance. Completing the development of this technology now will save immeasurable resources.



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Glenn Research Center (GRC)

### Responsible Program:

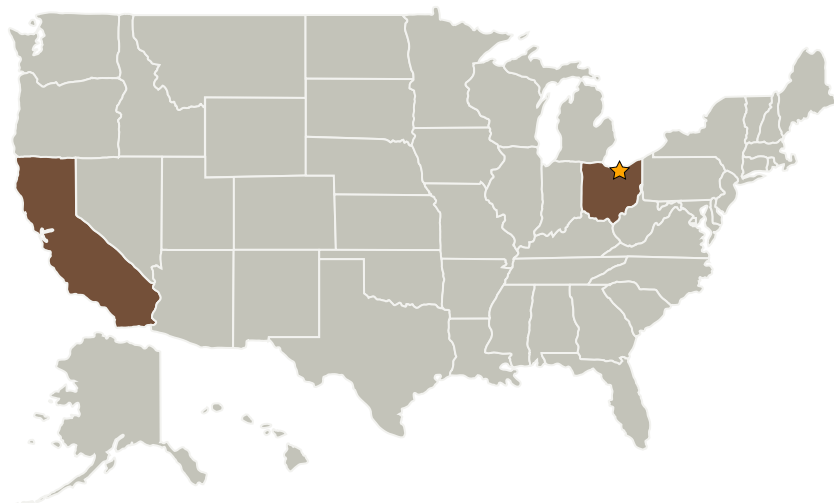
Small Business Innovation Research/Small Business Tech Transfer

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
VIDA Products	Supporting Organization	Industry	Santa Rosa, California

## Primary U.S. Work Locations

California	Ohio
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## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes